Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2024

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary level – 200 marks)

THURSDAY, 6 JUNE MORNING 9:30 – 12:00

Answer **any FOUR** questions.

All questions carry equal marks.

The 2024 examination papers were adjusted to compensate for disruptions to learning due to COVID-19. This examination paper does not necessarily reflect the same structure and format as the examination papers of past or subsequent years.

Question 1. **(50 marks)**

Give **brief** answers to **any eight** of the following:

(a) Identify mechanism **A and** give **one** application for it.



mechanism A

(b) Explain the term *electrical conductor*.

(c) State **one** benefit of making prototypes as part of the design process.

(d) Give **one** reason for using cutting fluids when machining.

(e) State **two** safety precautions that should be followed when using a metal shears.



metal shears

(f) Explain the term *alloy* **and** name **one** alloy.

(g) State **two** properties of aluminium.

(h) Name the type of chuck shown **and** give **one** suitable use for it.



chuck

(i) Explain the term *ferrous metal* **and** give **one** example of a ferrous metal.

(j) Describe the main operating features of **any one** of the following:



(i) Wire stripper,



(ii) Knurling tool,



(iii) Scroll saw.

(k) Explain **any one** of the following:

(i) Drone technology, **(ii)** Autonomous vehicle, **(iii)** Solar energy.

(l) Define the term *brittleness* **and** name **one** material that is brittle.

(m) Explain **any one** of the following:

(i) Swarf, **(ii)** Taper tap, **(iii)** Deburring.

Question 2. **(50 marks)**

(a) Name the metals produced from **each** of the furnaces listed below:

(i) Blast furnace, **(ii)** Cupola furnace, **(iii)** Electric arc furnace.

(b) Select **one** of the furnaces listed at **Q2 (a)** above and answer **each** of the following:

(i) Draw a labelled diagram of the selected furnace;

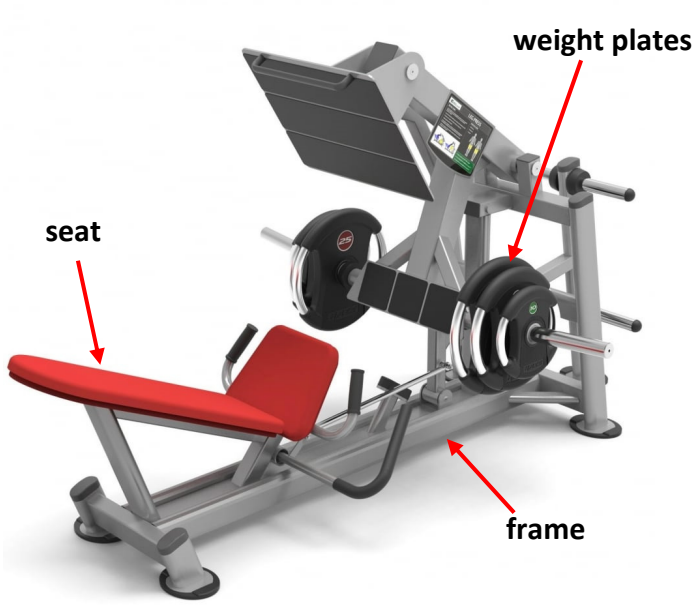
(ii) List the materials used in the charge;

(iii) Describe how the charge is heated.

(c) The leg press weight machine shown below is a common feature in most gyms.

(i) Name **one** suitable material for **each** of the parts labelled on the leg press weight machine.

(ii) State **one** reason for the selection of **each** material.

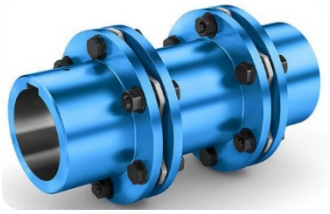


leg press weight machine

(d) The coupling shown is assembled using a temporary joining process.

(i) State **one** advantage of using a temporary joining process.

(ii) Identify a temporary joining process which could be used in the assembly of the coupling shown.



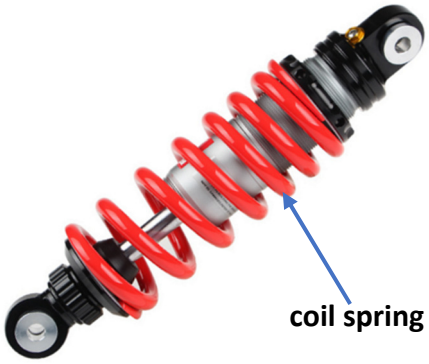
coupling

Question 3. **(50 marks)**

(a) In relation to the heat treatment of steel, explain **any two** of the following:

(i) Normalising, **(ii)** Quenching, **(iii)** Carbon content.

(b) The coil spring shown is annealed, hardened and tempered during the manufacturing process.



Describe **any two** of the following heat treatment processes:

(i) Annealing,

(ii) Hardening,

(iii) Tempering.

(c) State **two** safety precautions to be observed during the heat treatment of metals.

(d) Explain **any two** of the following metal properties:

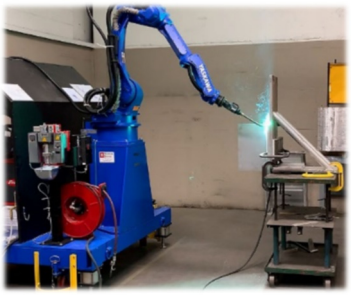
(i) Elasticity, **(ii)** Melting point, **(iii)** Compressive strength.

OR

(d) State **one** advantage for **each** of the robotic processes shown below:







(i) Robotic lawn mowing, **(ii)** Robotic waste sorting, **(iii)** Robotic welding.

Question 4. **(50 marks)**

(a) An oxy-acetylene gas welding torch is shown below.

(i) Explain the function of valve **A and** the function of valve **B**.



oxy-acetylene gas welding torch

(ii) Name **two** flame types that can be produced in oxy-acetylene welding.

(b) State the function of **any three** of the following in manual metal arc welding:









(i) Earth clamp, **(ii)** Welding mask, **(iii)** Leather gloves, **(iv)** Welding magnet.

(c) Answer **any three** of the following:

(i) Explain the function of the plastic casing on the electrode holder shown.

(ii) Explain why it is important to work in a well-ventilated area when using adhesives.

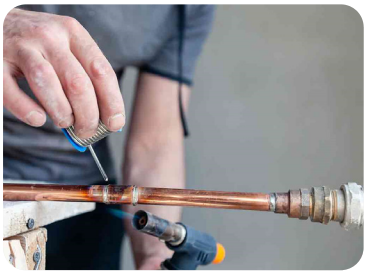
(iii) State **one** reason why flux is required when soldering.

(iv) Give **one** advantage of using a locknut when assembling project work.



electrode holder

(d) State **two** safety precautions to be observed when soldering copper pipes and fittings.



Question 5. **(50 marks)**

(a) The items shown below are produced by various plastic manufacturing processes.



Chair



Water bottle



Toy car

(i) Name a plastic manufacturing process used in the production of **each** of the items shown above.

(ii) Describe with the aid of a labelled diagram **any one** of the manufacturing processes, named by you, at **Q5 (a)(i)** above.

(b) Select **any two** of the plastic materials listed below **and** identify **one** suitable product which can be manufactured from **each** of the plastic materials selected.

(i) Polyvinyl Chloride (PVC),

(ii) Nylon,

(iii) Polystyrene (PS),

(iv) Acrylonitrile Butadiene Styrene (ABS).

(c) State **two** safety precautions to be observed when using a strip heater.

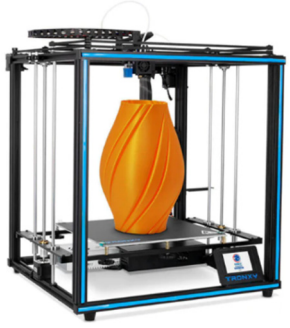
(d) In relation to plastic technology, describe **any two** of the following:



(i) Plastic dip coating,



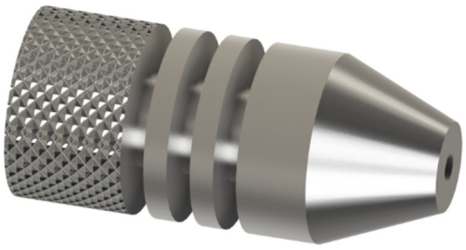
(ii) Thermosetting plastics,



(iii) 3D Printing.

Question 6. **(50 marks)**

(a) The engineering component shown is to be manufactured on a centre lathe.
Identify **three** lathe processes used to manufacture the engineering component.



engineering component

(b) Explain **any three** of the following in relation to machining:

(i) Rake angle,

(ii) Chuck key,

(iii) Depth of cut,

(iv) Pilot hole.

(c) A part for a centre lathe is shown opposite.



(i) Name the centre lathe part shown.

(ii) Identify **one** use for this centre lathe part.

(iii) State **two** safety precautions to be observed when using a centre lathe.

OR

(c) CNC Laser cutting is frequently used in schools and industry as part of the manufacturing process.



(i) Explain the term CNC.

(ii) List **two** advantages of using a CNC laser cutter in engineering manufacture.

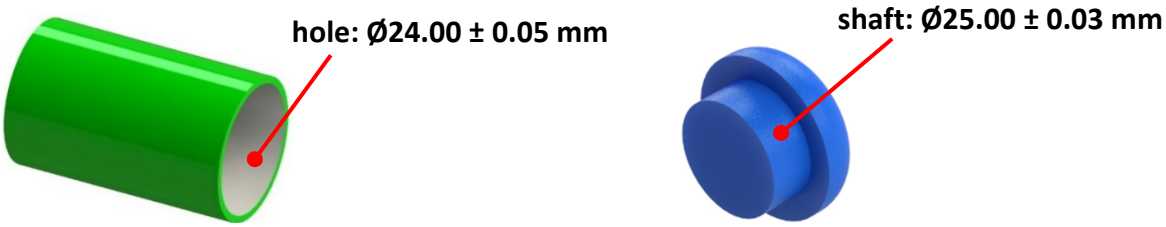
(iii) Identify **one** safety precaution to be observed when using a CNC laser cutter.

Question 7. **(50 marks)**

(a) **(i)** Name **any two** types of fit in a hole and shaft assembly.

(ii) Describe **any one** of the fits named at **Q7 (a)(i)** above.

(b) A waste pipe and plug are machined to the dimensions shown below.



waste pipe **plug**

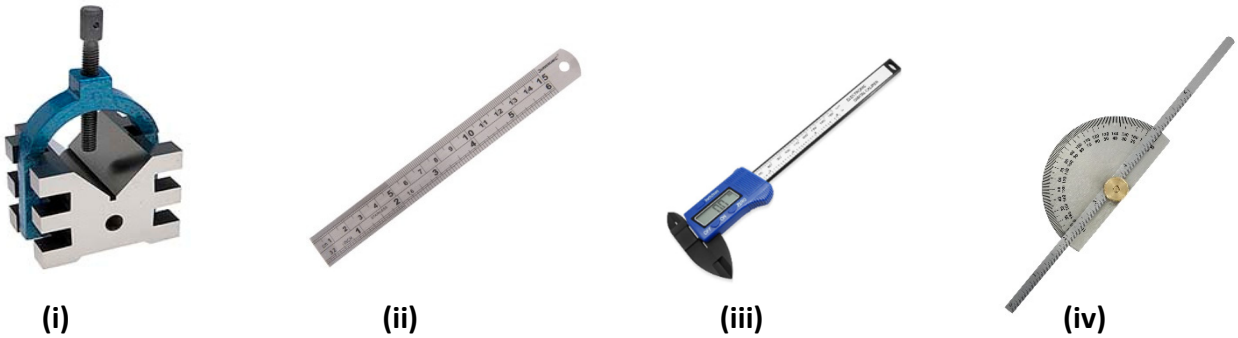
State the: **(i)** Nominal diameter of the **hole**;

(ii) Smallest diameter of the **shaft**;

(iii) Largest diameter of the **hole**;

(iv) The type of fit which will result from the assembly of the smallest shaft and the largest hole.

(c) Name **any three** of the instruments shown **and** give **one** application of **each** instrument named.



(i) **(ii)** **(iii)** **(iv)**

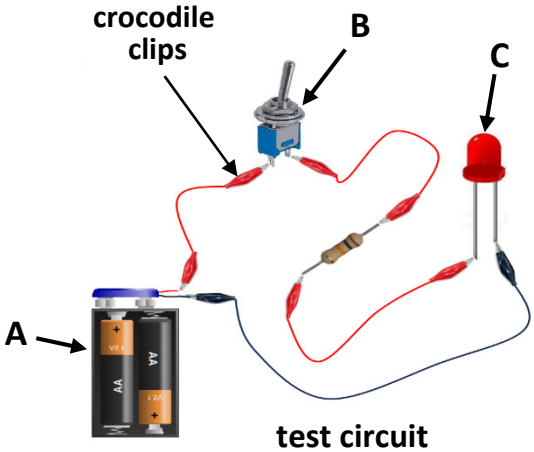
OR

(c) The test circuit shown uses crocodile clips for assembly.

(i) Name the **three** electronic components labelled **A**, **B** and **C**.

(ii) Draw the electronic symbol for **each** of the electronic components **A**, **B** and **C**.

(iii) State **one** advantage of using crocodile clips when assembling test circuits.



test circuit